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A STATISTICAL STUDY OF THE TEC STORM-TIME RESPONSE AT EUROPEAN MIDDLE LATITUDES FOR USE IN IONOSPHERIC NOWCAST AND FORECAST

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Summary. An operational system for Total Electron Content (TEC) nowcast and forecast is being developed[1] to assist in monitoring the ionospheric effects on Global Navigation Satellite System (GNSS) applications[2]. For the purpose, TEC measurements[3] from local (Dourbes, 50.1ºN, 04.6ºE), and European IGS (International GNSS Service) stations have been used to obtain the TEC changes during the ionospheric storms of the last solar activity cycle. Thus, data representing nearly 300 storm events have been analysed with respect to geomagnetic storm intensity, i.e. class I (Dst≤-100nT) and class II (-100nT<Dst≤-50nT), season (winter, equinox, and summer), and latitude. During storms, the TEC relative deviation from the "quiet" average/median behaviour depends heavily on the storm time elapsed (i.e. the time passed from the geomagnetic storm onset) but also on season and latitude. Therefore, for modelling purposes, the average response pattern is suitably expressed as a function of the storm intensity and time, season and latitude. In the forecast procedure, the TEC temporal behaviour is considered as composed of a periodic component (average, non-disturbed ionospheric conditions) and a random component (disturbed ionospheric conditions). While the average behaviour can be obtained from a climatological model, the key challenge is to estimate in advance the storm-time component. This estimation is performed here by using the modelled storm-response pattern and the predicted values of geomagnetic indices (Dst and K/Kp). The operational forecast performance will be evaluated with instantaneous measurements from recent storm events.

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